

REMARKS

Reconsideration of the application in view of the above amendments and the following remarks is requested. Claims 14-20, 33-37, and 39-46 are in this application. Claim 14 has been amended. Claims 1-13, 21-32, and 38 have been cancelled. Claims 43-46 have been added to alternately and additionally claim the present invention.

The Examiner objected to claims 14-20 and 30-38 because claim 14 lacks clarity. Claim 14 was amended to provide the additional clarity requested by the Examiner.

The Examiner rejected claims 14-16, 18-20, and 30-42 under 35 U.S.C. §103(a) as being unpatentable over Lu et al. (U.S. Patent No. 6,107,177) in view of Adams (U.S. Patent No. 6,566,242 B1) and Inohara et al. (U.S. Patent No. 5,976,972). For the reasons set forth below, applicant respectfully traverses this rejection.

Claim 14 recites, in part:

“etching the layer of insulation material to form a plurality of trenches in the layer of insulation material.”

Independent claim 39 recites the same limitation.

In rejecting the claims, the Examiner pointed to the etching step which forms trench 24 shown in FIG. 5 of Lu as teaching the step of etching a layer of insulation material. The Examiner noted that the Lu reference does not teach the step of forming a plurality of trenches as required by claims 14 and 39, but argued that it would be obvious to form a plurality of trenches in lieu of trench 24 in Lu in view of the Adams and Inohara references.

With regard to the Adams reference, the Examiner pointed to FIGS. 5-9 and the related text as teaching most of the missing limitations. However, the Examiner

does not appear to have identified, and applicant can not find, the steps in the Adams reference which the Examiner believes read on the requirement to form a plurality of trenches.

For example, FIG. 5 of the Adams reference shows the formation of two contact via holes 510 through oxide layer 450. (See also column 6, lines 38-40 of Adams.) In addition, as shown in FIGS. 9 and 10 of Adams, after a number of intervening processing steps, the contact via holes are reopened as contact via openings 910.

Contact/via holes and trenches, however, are not the same thing, and a contact/via hole can not be read to be a trench. (A trench, by definition, has a width and a length that is many times greater than the width.) As a result, the formation of the contact via holes 510 and 910 in Adams can not be read to be the formation of a plurality of trenches as required by the claims. Thus, without further direction from the Examiner, it is unclear to applicant how the Adams reference is being applied.

With respect to Inohara, the Examiner pointed to FIGS. 11, 20, and 21 of the Inohara reference as teaching the formation of trenches which have a width and a length that is many times greater than the width. With respect to FIG. 11, it is noted that FIGS. 8A and 8B of Inohara show the effect of misalignment when a contact hole 48 is the same width as a wiring groove 46, while FIGS. 9A and 9B of Inohara show the same effect of misalignment when the contact hole 48 is wider than the width of the wiring groove 46. FIGS. 10 and 11 of Inohara, in turn, show the area penalty that must be paid to use the wider contact holes 48.

However, the Examiner did not indicate, and applicant can not determine, how the teaching that a wider contact opening leads to an area penalty is related to the requirement to form a plurality of trenches. The rectangular contact openings 48 shown in FIG. 11 of Inohara can not be read to be trenches because, although the length is greater than the width, the length is not many times greater than the

width as in the case of a trench. Thus, without further direction from the Examiner, FIG. 11 appears to have no relevance to the formation of a plurality of trenches as required by claims 14 and 39.

With respect to FIGS. 20 and 21 of Inohara, it is noted that FIGS. 16-21 are part of a process flow that forms contact holes 36 in stopper film 14a as shown in FIG. 18 of Inohara. (See column 9, lines 36-37 of Inohara.) Following this, an insulating film 14b is formed (see FIG. 19), followed by the formation and patterning of a resist layer 35 (see FIG. 20). Following this, layers 14b and 13b are etched to form grooves 31 and contact holes 32.

However, the Examiner did not indicate, and applicant can not determine, how the formation of grooves 31 and contact holes 32 is related to the requirement to form a plurality of trenches as required by claims 14 and 39. As noted above, contact holes 32 can not be read to be trenches. Further, it is unclear how the formation of grooves 31 in Inohara would motivate one skilled in the art to form multiple trenches in lieu of the single trench 24 shown in FIG. 5 of Lu. Thus, without further direction from the Examiner, it is unclear to applicant how the Inohara reference is being applied.

Therefore, since it is unclear how the teachings of the Adams and Inohara references have been applied, the Examiner has not set forth a prima facie case of obviousness. As a result, claims 14 and 39 are patentable over Lu in view of Adams and Inohara. In addition, since claims 15-16, 18-20, and 30-37 depend either directly or indirectly from claim 14, claims 15-16, 18-20, and 30-37 are patentable over Lu in view of Adams and Inohara for the same reasons as claim 14. Further, since claims 40-42 depend either directly or indirectly from claim 39, claims 40-42 are patentable over Lu in view of Adams and Inohara for the same reasons as claim 39.

The Examiner also rejected claim 17 under 35 U.S.C. §103(a) as being unpatentable over Lu et al. in view of Adams and Inohara et al. and further in view

of Yu et al. (U.S. Patent No. 5,952,704). In rejecting claim 17, which depends from claim 14, the Examiner argued that Lu, Adams, and Inohara disclose substantially all of the limitations of claim 17. However, as just noted, Lu, Adams, and Inohara do not disclose substantially all of the limitations of claim 17. Thus, claim 17 is patentable over Lu in view of Adams, Inohara, and Yu for the same reasons that claim 14 is patentable over Lu in view of Adams and Inohara.

New claim 43 recites, in part:

“etching the layer of insulation material and the plurality of trenches to lower a portion of the top surface of the layer of insulation material to form a trench surface that lies below and parallel to the top surface of the layer of insulation material, and to lower the bottom surface of each trench to form a lowered bottom surface, a portion of the lowered bottom surface of each trench exposing a same conductive structure.”

From what can be determined, the Lu, Adams, and Inohara references do not teach an etching step wherein a portion of the lowered bottom surface of each trench exposes a same conductive structure. As a result, new claim 43 is patentable over Lu in view of Adams and Inohara. In addition, since claims 44-46 depend either directly or indirectly from claim 43, claims 44-46 are patentable over Lu in view of Adams and Inohara for the same reasons as claim 43.

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Thus, for the foregoing reasons, it is submitted that all of the claims are in a condition for allowance. Therefore, the Examiner's early re-examination and reconsideration are requested.

Respectfully submitted,

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AMENDMENT IN RESPONSE TO  
OFFICE ACTION DATED FEBRUARY 4, 2005

Atty. Docket No. 100-18011  
(P05268-D01-C1)